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(54) Device for transferring ampuls and the like.

(57) Ampuls 5 are received in an upright position in the grooves of a conveying screw 4, being supported by a first guide 6. The first guide 6 is arranged so that the end at the delivery end of the screw 4 is higher than that at the feed end. This results in the ampuls being tilted over into a horizontal position as they are conveyed in the direction D. A second guide 7 engages the necks on the ampuls 5 when they are in the horizontal position. The ampuls 5 are transferred to and from the screw 4 by star wheels (not shown) having suction support recesses, the screw 4 and star wheels being synchronised.

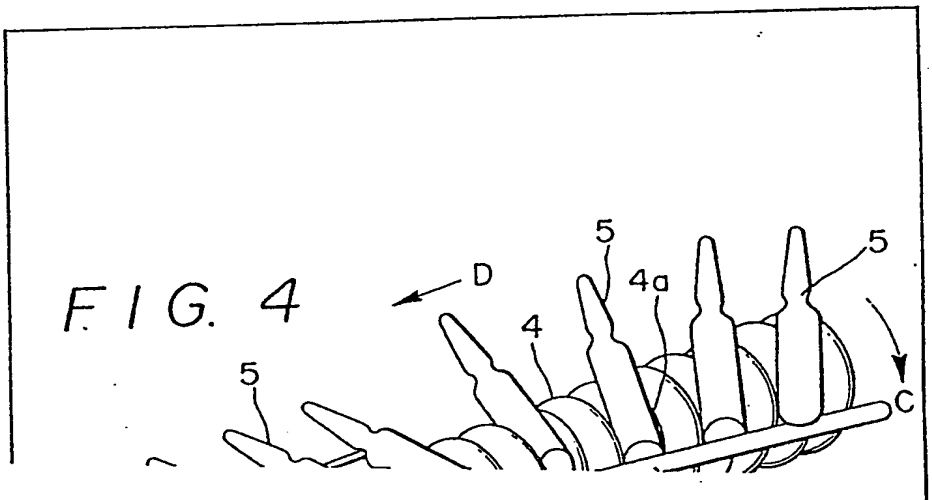

FIG. 4

ERRATUM

SPECIFICATION NO 2096558A

Front page, Heading (71) Applicants *after* Takeda Yakuhin Kogyo Kabushiki Kaisha, *insert* (also known as Takeda Chemical Industries Ltd)

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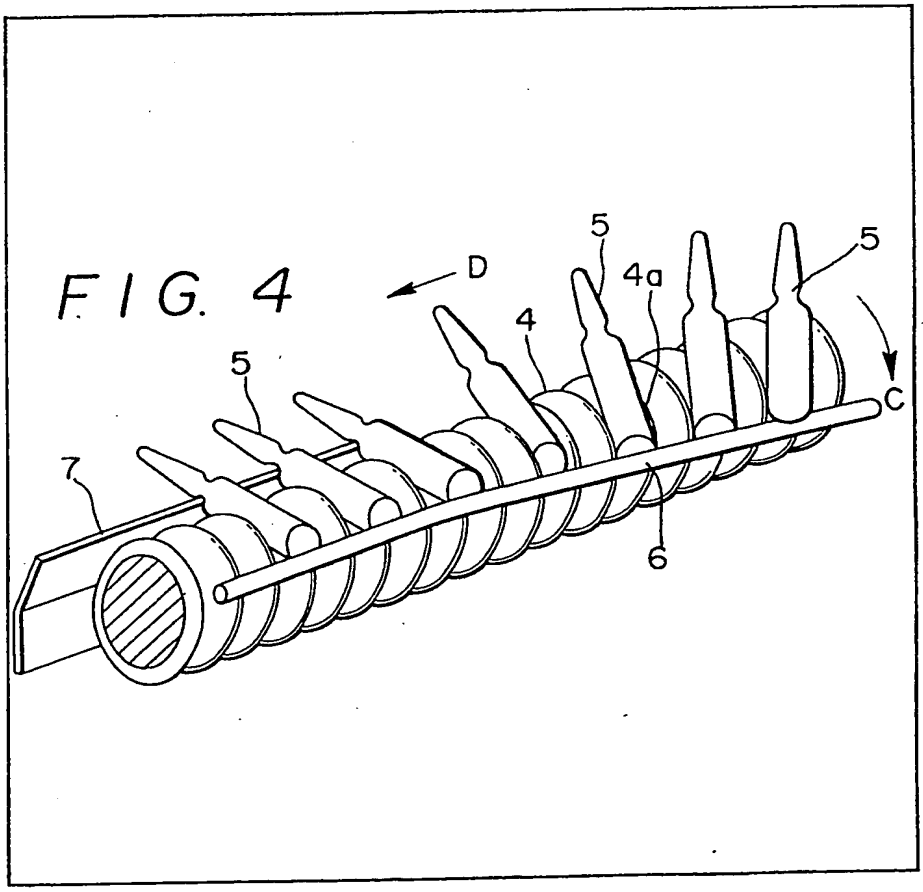

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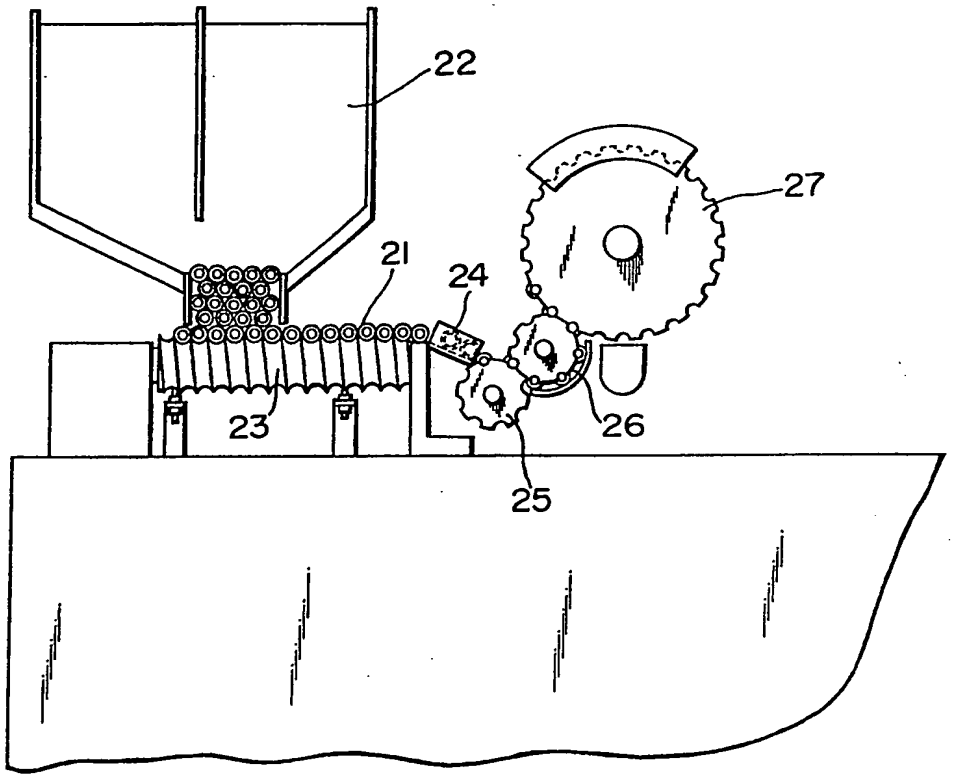
FIG. 1



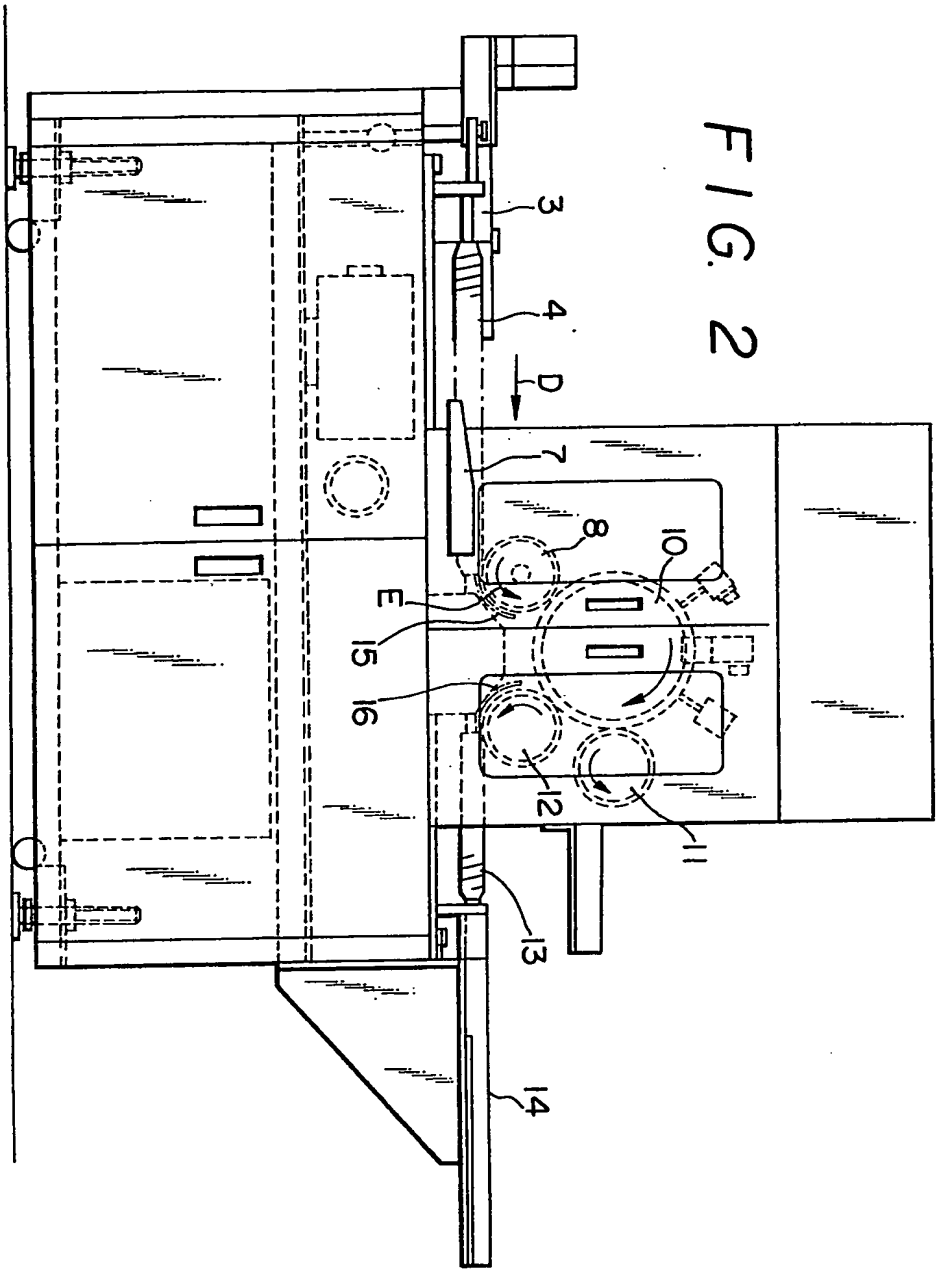


FIG. 2

FIG. 3

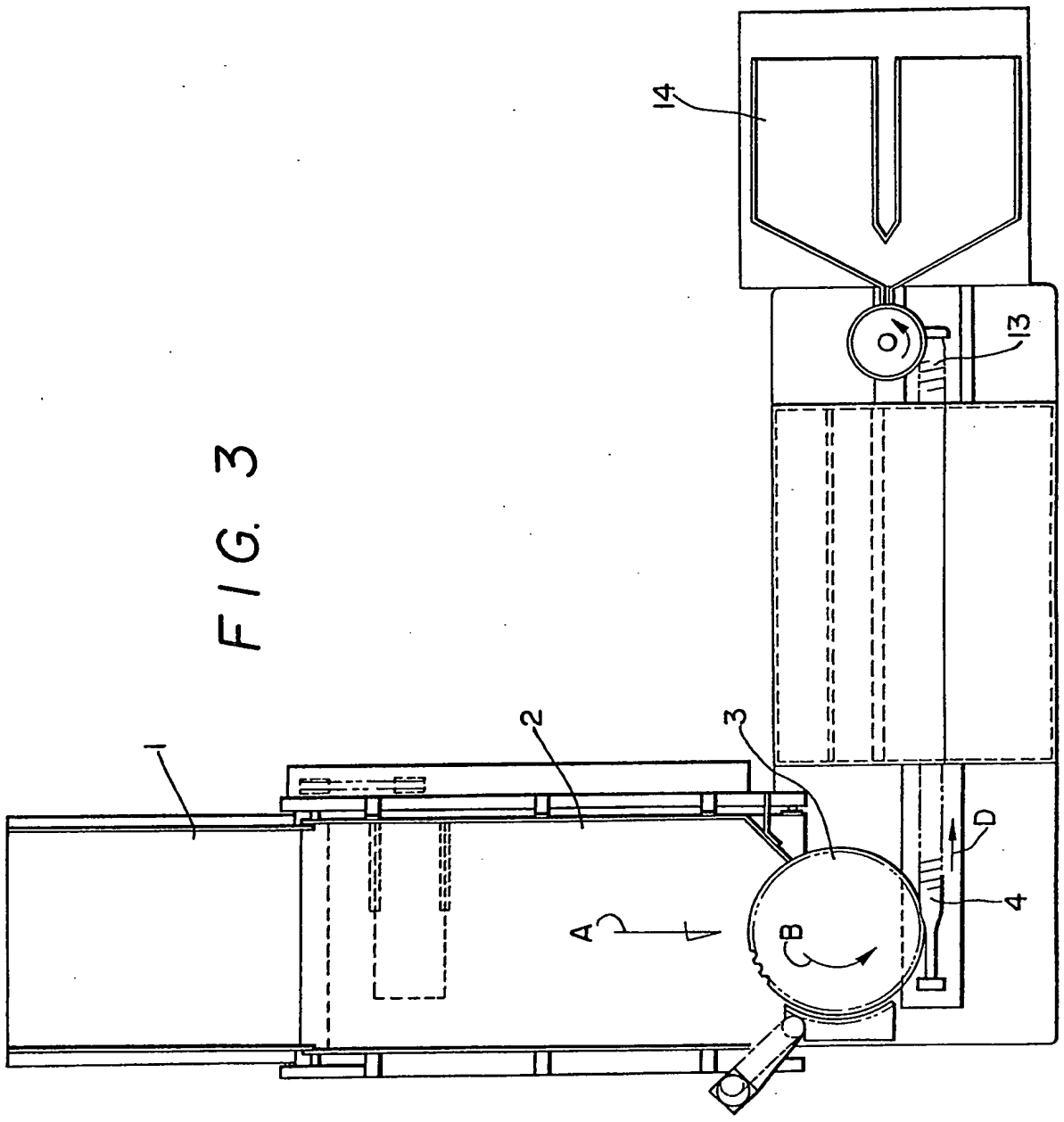


FIG. 4

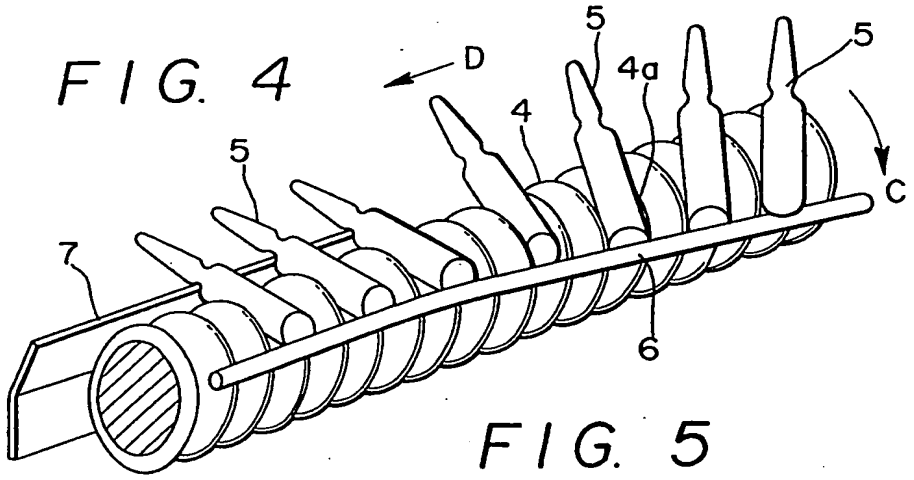


FIG. 5

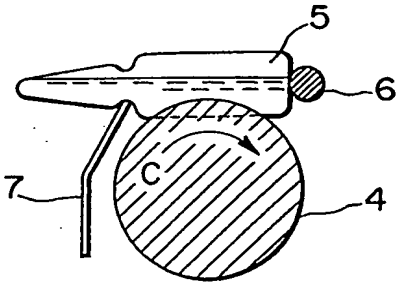
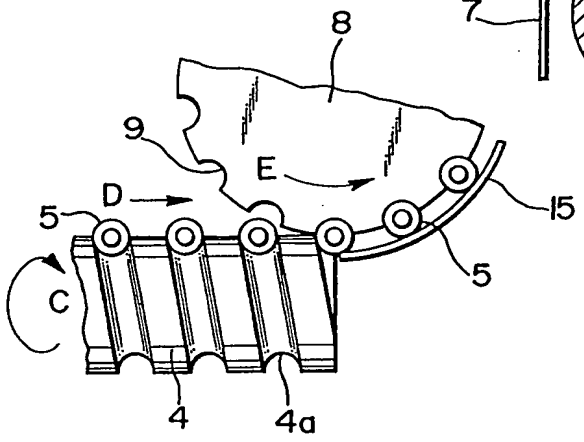


FIG. 6



SPECIFICATION

Device for transferring ampuls and the like

Background of the invention

This invention relates to a device for transferring ampuls and the like for conveying ampuls and the like by means of a screw, and transferring the ampuls and the like from the screw to a rotary member for conveying them from the screw while holding them in horizontal condition, for transferrence to a station where they can be checked for possible presence of pinholes or the name of the content can be printed thereon.

When ampuls each containing a dose of sterile medicine have pinholes or cracks, for example, there would be the danger that a secondary infection may develop due to invasion of the defective ampul by micro-organisms. Thus the sealed ampuls should be subjected to leak tests for detecting if there are pinholes and cracks in the ampuls.

A method for electrically detecting the presence of pinholes and craks in ampuls in leak tests has been proposed by the applicant of this application and is known (Japanese Patent No. 794241). This detecting method enables leak tests to be carried out automatically without requiring any manual attention continuously over a prolonged period of time, and can achieve the effects of having high detection limits and not adversely affecting the medicine sealed therein (not injurious to health). In this detecting method, it is advisable to carry out tests by supporting the ampuls in horizontal condition, in view of the fact that the test utilizes the electric conductivity of the medicine sealed therein.

Proposals have been made by the application of this application to use various pinhole detecting machines by which the aforesaid testing method can be best carried into practice. One example of such machines is shown in Figure 1.

As shown, the numeral 22 designates a hopper for successively supplying sealed ampuls 21 which is slightly tilted to arrange the ampuls substantially in horizontal condition. The numeral 23 designates a screw conveyor for receiving the ampuls 21 supplied by the hopper 22 in groove. A guide plate, not shown, is mounted in the vicinity of the screw conveyor 23 for guiding the ampuls fed by the screw conveyor into substantially horizontal positions as they are conveyed thereby. The ampuls 21 conveyed by the screw conveyor 23 while being kept in horizontal condition move downwardly one by one along a sliding plate 24 from which they are fed to a supply star wheel 25. The ampuls 21 are transferred from the supply star wheel 25 through a conveyor star wheel 26 to a detecting star wheel 27 where they are checked for pinholes. The supply star wheel 25, conveyor star wheel 26 and detecting star wheel 27 are each formed with ampul holding recesses having the same spacing intervals.

The pinhole detecting machine of the aforesaid construction has no trouble when the conveying device for transferring the ampuls to the detecting star wheel conveys the ampuls in succession without any gap in the row of transferred ampuls. However, when there are gaps in the row of transferred ampuls or when there are vacancies in the row of the ampuls, the ampuls would suddenly move downwardly along the sliding plate 24 and might fly out of the machine without being deposition in the recesses, thereby causing damage to the ampuls.

According to the present invention there is provided a device for transferring ampuls and the like comprising:

a screw for receiving the ampuls and the like to be transferred successively;

a conveyor star wheel arranged close to an end of the screw and located thereabove, said conveyor star wheel being formed on its outer periphery with a plurality of support recesses each for holding one of the ampuls and the like in position, said support recesses being spaced apart from each other in an interval which is substantially same with a pitch of said screw;

guide means for guiding the ampuls and the like to be brought from upstanding position to horizontal position as the ampuls and the like are moved from one end of the screw to the other end thereof; and

a control for controlling the screw and the conveyor star wheel in rotation so as to bring a conveying groove of said screw and the support recesses into coincidence while the screw and the conveyor star wheel are rotated in synchronism with each other;

whereby the ampuls and the like can be directly transferred from the screw to the conveyor star wheel and vice versa.

A preferred embodiment has been developed for the purpose of obviating the aforesaid disadvantages of the prior art. Accordingly the preferred embodiment provides a device for transferring ampuls and the like which enables ampuls to be transferred without trouble to the rotary support member even if there are gaps in the row of the supplied ampuls and which is small in the number of component parts compact in size.

Figure 1 is a front view of a pinhole detecting machine of the prior art;

Figure 2 and *3* are a front view and a plan view respectively of a pinhole detecting machine provided with a transfer device according to the invention;

Figure 4 is a perspective view of the screw conveyor;

Figure 5 is a sectional view of the transfer device showing a portion thereof in the vicinity of the discharge end of the screw conveyor; and

Figure 6 is a fragmentary front view, on an enlarged scale, of the discharge end of the screw conveyor.

Detailed description of the preferred embodiment

A preferred embodiment of the invention will now be described by referring to the accompanying drawings.

Figures 2 and 3 are a front view and a plan view, respectively of the machine for detecting pinholes in ampuls. The numeral 1 designates a supply table for completed ampuls, not shown, having a dose of

medicine sealed therein. Ampul supply means which is a belt conveyor 2 in this case is disposed posterior to the ampul supply table 1, the belt conveyor 2 traveling in the direction of an arrow A (See Figure 3). Disposed adjacent the belt conveyor 2 on an end thereof opposite the ampul supply table 1 is a star wheel 3 for feeding the ampuls which rotates in the direction of an arrow B. The star wheel 3 is formed with an ampul feeding screw 4 on a peripheral surface threof opposite the conveyor 2, and the screw 4 is formed with a spirally arranged conveyor groove 4a. The conveyor groove 4a is adapted to support one of ampuls 5 which is snugly fitted therein as shown in Figure 4. The ampuls 5 supplied from the star wheel 3 is fitted in the conveyor groove 4a of the screw 4 in upright position, and placed on a first guide member 6 extending from the position in which the ampuls 5 are fitted on the screw 4 to the discharge end of the screw 4 axially of the screw 4. The first guide member 6 is arranged in a gentle curve so that one end thereof is disposed slightly above the other end thereof. Thus as the screw 4 rotates in the direction of an arrow C, the ampuls 5 are guided by the first guide member 6 and changes its position from vertical to horizontal as they are conveyed by the screw 4 in the direction of an arrow D.

A second guide member 7 is located on a side of the screw 4 opposite the side on which the first guide member 6 is located and extends from the position in which the ampuls 5 become substantially horizontal in position to the discharge end of the screw 4. In this embodiment, the second guide member 7 is in the form of a plate member which is in a position in which its minor dimension is directed vertically. The second guide member 7 is brought into contact with a constructed portion 5a of each ampul 5 which is conveyed to the discharge end of the screw 4 as guided by the first guide member 6 and the second guide member 7 substantially in horizontal position as shown in Figure 5.

Referring to Figure 6, located in the vicinity of the screw 4 above the discharge end thereof is a conveyor star wheel 8 which is formed on its outer circumferential surface with a plurality of support recesses 9 spaced apart from each other substantially the same spacing interval as the conveyor screw grooves 4a. In this case, the screw 4 and the conveyor star wheel 8 are controlled by a control, not shown, in rotation in such a manner that they are synchronized in rotation and the conveyor groove 4a coincide with the respective support recesses 9 as the conveyor star wheel 8 rotates in the direction of an arrow E.

Located posterior to the conveyor star wheel 8 is a detecting star wheel 10 around which a pinhole detecting device of the known construction is mounted. The pinhole detecting device forms no part of the present invention so that the description thereof shall be omitted. Mounted around the detecting star wheel 10 are a defective article ejecting star wheel 11 and sound article conveyor star wheel 12, the latter being connected to a conveyor screw 13 and an ampul ejection tray 14. The detecting star wheel 10, defective article ejecting star wheel 11 and sound article conveyor star wheel 12 rotate in respective directions indicated by arrows in Figure 2 and are formed with support recesses of the same shape and configuration as the support recesses 9 formed in the conveyor star wheel 8. All the star wheels including the conveyor star wheel 8 are each provided with suction means (vacuum drawing means) built therein for drawing the ampuls by suction to the respective star wheel.

An auxiliary guide plate 15 is mounted between the lower-most position of the conveyor star wheel 8 and the detecting star wheel 10 for preventing the ampuls 5 from dropping along the periphery of the conveyor star wheel 8. A guide plate 16 similar to the auxilliary guide plate 15 is mounted on the side of the sound article conveyor star wheel 12.

Conveying of the ampuls 5 by the pinhole detecting machine incorporating therein the device for transferring ampuls according to the invention will now be described.

Referring to Figure 3, the completed ampuls 5 placed on the supply table 1 are transferred to the belt conveyor 2 and conveyed in the direction of an arrow A. The ampuls 5 being conveyed are each in upright position and supplied successively to the screw 4 by the supply star wheel 3. The means for supplying the ampuls 5 to the screw 4 is not limited to that shown and described in this embodiment, and other suitable means, such as a hopper, may be used as desired.

The ampuls 5 supplied to the screw 4 in this way are each fitted in one of the conveyor groove 4a and conveyed in the direction of the arrow D as the screw 4 rotates while the ampuls 5 have their bottoms positioned against the first guide member 6. When the ampuls 5 reach the discharge end of the screw 4, they are substantially in horizontal position. As the conveyor groove 4a of the screw 4 and the support recesses 9 of the conveyor star wheel 8 are moving in synchronism with each other, the ampuls 5 in the conveyor groove 4a are each directly transferred to one of the support recesses 9 of the conveyor star wheel 8. In this case, after clearing the end of the screw 4, each ampul 5 is drawn by suction by the drawing means and guided by the guide plate 15, so that the ampuls 5 are supplied to the detecting star wheel 10 while being held in position in the support recesses 9. After being subjected to predetermined tests in the detecting star wheel 10, defective ampuls are transferred to the defective article star wheel 11 and sound articles are transferred to the sound article conveyor star wheel 12. The ampuls found to be sound articles are then ejected onto the ampul ejection tray 14 via the conveyor screw 13. The ampuls are directly transferred from the sound article conveyor star wheel 12 to the conveyor screw 13.

The ampuls 5 are conveyed as aforesaid. The arrangement whereby the ampuls 5 are directly transferred from the screw 4 to the conveyor star wheel 8 enables the ampuls 5 to be transferred without trouble to the conveyor star wheel 8 even if there are gaps in the row of ampuls being conveyed, with only some of the support recesses 9 being left unoccupied. In contrast, in the transferring device of

the prior art shown in Figure 1, the ampuls would move rapidly in sliding movement along the sliding plate 24 and might be broken. When such accident happens, it has hitherto been customary to shut down the machine. Additionally the transferring device of the prior art requires the sliding plate 24 and the supply star wheel 25 which are dispensed with in the transferring device according to the invention, thereby enabling a compact size and reduced cost to be obtained in a device for transferring ampuls.

In the embodiment shown and described hereinabove, the transferring device according to the invention has been shown and described as being incorporated in an ampul pinhole detecting machine. It is to be understood, however, that the invention is not limited to this specific use of the transferring device and that it can be used with a printing press for printing the name and the like on each ampul. Also, the invention can have application in the conveyance of not only ampuls but also vials.

From the foregoing description, it will be appreciated that the device for transferring ampuls and the like according to the invention can achieve the effects of obtaining a compact size in a transferring and reducing its cost while being able to positively transfer ampuls from the screw to the star wheel.

CLAIMS

1. A device for transferring ampuls and the like comprising:

a screw for receiving the ampuls and the like to be transferred successively;

a conveyor star wheel arranged close to an end of the screw and located thereabove, said conveyor star wheel being formed on its outer periphery with a plurality of support recesses each for holding one of the ampuls and the like in position, said support recesses being spaced apart from each other in an interval which is substantially same with a pitch of said screw;

guide means for guiding the ampuls and the like to be brought from upstanding position to horizontal position as the ampuls and the like are moved from one end of the screw to the other end thereof; and

a control for controlling the screw and the conveyor star wheel in rotation so as to bring a conveying groove of said screw and the support recesses into coincidence while the screw and the conveyor star wheel are rotated in synchronism with each other;

whereby the ampuls and the like can be directly transferred from the screw to the conveyor star wheel and vice versa.

2. A device for transferring ampuls and the like as claimed in claim 1, further comprising suction means mounted in said conveyor star wheel for drawing by suction the ampuls and the like to positively hold them in place in the support recesses.

3. A device for transferring ampuls and the like, substantially as hereinbefore described with reference to Figures 2 to 6 of the accompanying drawings.

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